



## What Is an Analemma?

If you were to photograph the Sun every day, say at local noon, for a year, its path against the sky would be a long, skinny figure-8 pattern. This pattern is called an analemma. Many years ago, I remember seeing an analemma printed on the side of numerous

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terrestrial globes, usually in a blank area of the Pacific Ocean. It's a useful graph that tells much about the Sun's visibility and the length-of daylight for any place on Earth. Since most globe users generally don't know the meaning or func-

tion of this mysterious symbol, however, globe makers ordinarily omit it nowadays.

An analemma is produced by the combined effect of the Earth's tilted axis of rotation and eccentric (elliptical) orbit. If the Earth's axis had no tilt and its orbit were perfectly circular, there would be no analemma – the Sun would reach the same point in the sky at exactly the same time every single day.

Since the Earth's axis is tilted 23.5°, the apparent annual path of the Sun in the

sky, called the ecliptic, is also tilted 23<sup>1</sup>/<sub>2</sub>° with respect to the celestial equator. This means that at the June solstice the Sun is 23<sup>1</sup>/<sub>2</sub>° north of the equator, and at the December solstice it's 23<sup>1</sup>/<sub>2</sub>° south. This yearly north-south wandering of the Sun accounts for the lengthwise extension of an analemma pattern.

And since the Earth's orbit is eccentric, not circular, our planet's distance from the Sun changes throughout the year. Earth makes its closest approach to the Sun (perihelion) in early January and

As explained in the text, owing to the Sun's changing declination and the equation of time, the Sun traces a long, drawn-out figure 8 in the sky. John Raffell made this composite by digitally combining 52 individual exposures he obtained from Muscat, Oman, close to the Tropic of Cancer (latitude 23<sup>1</sup>/<sub>2</sub>° north). Raffell used a 28-millimeter lens, Kodak Gold 100 film, and a neutral-density filter to shoot the Sun from precisely the same position at 7:30 a.m. local time every week for a full year, starting in mid-May 2000. For the foreground silhouette he took a normal (unfiltered) exposure with the Sun behind Muscat's Fort Jalali.

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